# BEEF CATTLE RESEARCH UPDATE

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**Effects of Monensin on Performance of Growing Steers Grazing Wheat Pasture**

Recent University of Arkansas research (2016) evaluated the performance of growing steers grazing wheat pasture fed free choice mineral designed to supply 200 mg/day of monensin (Rumensin; Elanco Animal Health), 20 mg/d bambermycin (Gainpro; Huvepharma, Inc.), or a non-medicated mineral using 315 calves initially weighing 538 lb.[1] Monensin is labeled by FDA to increase weight gain in pasture cattle when fed at a level of 50 to 200 mg per head per day. In this study, overall average daily gain (ADG) was not different (P = 0.42) for steers fed the non-medicated mineral (2.73 lb/day) or bambermycin mineral (2.80 lb/day) but was significantly greater (P≤ 0.05) for steers fed the monensin mineral (3.02 lb/day). Thus, feeding monensin increased ADG by 0.29 lb/day or 10.6% compared to feeding the non-medicated mineral. Previous University of Arkansas research (2014) also measured the effect of feeding a monensin containing mineral versus a non-medicated mineral in steers grazing wheat pasture.[2] In this study, steers fed a monensin mineral gained 0.15 more lb/day or 5.9% faster than steers fed a non-medicated mineral (2.69 vs. 2.54 lb/day). In a 2007 Oklahoma State University summary (4 year data set) feeding a monensin containing mineral to steers grazing wheat pasture increased ADG (P < 0.01) by 0.22 lb or 12.2% as compared with a non-medicated mineral (2.03 vs. 1.81 lb/day).[3]

In the original 24-trial pasture research summary that Elanco Animal Health used in getting monensin approved by FDA in 1978, feeding monensin increased ADG (P ≤ 0.0001) by 0.20 lb or 16.3% over control cattle (1.43 vs. 1.23 lb/day). Thus, the added gain response to monensin in these more recent studies (0.22, 0.15, and 0.29 lb/day, respectively, for studies published in 2007, 2014, and 2016) is nearly identical to that reported by Elanco nearly 40 years ago.

**Effects of Zinc Sulfate Supplementation on Feedlot Cattle Performance**

Zinc is an essential trace mineral that functions as an essential component of a number of important enzymes which affect metabolism of carbohydrates, proteins, lipids, and nucleic acids, all of which are essential for growth of cattle. In addition, numerous other enzymes are activated by zinc. These enzymes are involved in nucleic acid, protein, and carbohydrate metabolism and reproduction. Zinc also is necessary for normal development and function of the immune system.

The requirement for zinc in finishing cattle diets has been established at 30 ppm.[4] However, a 2007 survey of consulting feedlot nutritionists showed that these nutritionists recommend total dietary zinc levels that ranged from 40 to 212.5 ppm with a mean recommendation of approximately 93 ppm (mode of 100 ppm). [5] A 2016 survey of consulting feedlot nutritionists showed that these nutritionists recommend added zinc levels (rather than total zinc) ranging from 34 to 130 ppm with a mean recommendation of approximately 87 ppm (mode of 100 ppm). [6] Since most feedstuffs typically used in feedlot rations contain 25 to 35 ppm zinc, these 2016 survey results suggest that the total dietary zinc level recommended by consulting nutritionists has increased by about 30 ppm since the 2007 survey. Recent Kansas State University research evaluated the effects of feeding different levels of zinc on feedlot performance and carcass traits of finishing heifers.[7,8]

In this experiment, 480 crossbred heifers (849 lb initial weight) were assigned to one of 4 treatments with 6 pens per treatment (24 pens with 20 heifers each) and fed 144 days. Treatments consisted of heifers receiving 0, 30, 60, or 90 ppm of supplemental zinc from zinc sulfate. The control diet (0 ppm supplemental zinc) contained approximately 32 ppm of zinc which would meet the suggested zinc requirement of 30 ppm. Hence, the 30, 60, and 90 ppm supplemental zinc treatments contained, respectively, 62, 92, and 122 ppm total zinc).

The effects of zinc supplementation on heifer performance and carcass traits are shown in Table 1. Zinc supplementation tended to linearly decrease dry matter intake (DMI) as zinc concentration of the diet increased (P = 0.07) resulting in a linear improvement in feed efficiency (P = 0.03) with the greatest improvement occurring in cattle fed 60 ppm of supplemental zinc. Cattle receiving supplemental zinc were 3.8% more efficient (P = 0.03) than cattle receiving no supplemental zinc (5.86 vs 6.09 lb feed/lb gain). These researchers noted that these results "suggest there is an upper limit for zinc supplementation to maximize feed efficiency and cattle respond favorably to zinc supplementation".

Table 1. Effect of zinc supplementation on feedlot performance and carcass traits.

| | Supplemental zinc, ppm | | | |
|---|---|---|---|---|
| Item | 0 | 30 | 60 | 90 |
| # of heifers | 117 | 118 | 118 | 120 |
| Feedlot Performance | | | | |
| Initial BW, lb | 850 | 847 | 849 | 850 |
| Final BW, lb | 1329 | 1329 | 1345 | 1327 |
| DMI, lb[1] | 22.60 | 22.32 | 21.94 | 21.78 |
| ADG, lb | 3.71 | 3.73 | 3.83 | 3.70 |
| Feed:Gain[2] | 6.09[b] | 5.99[b] | 5.71[a] | 5.89[ab] |
| Carcass Traits | | | | |
| HCW, lb | 837 | 835 | 845 | 836 |
| Dressing % | 63.01 | 62.86 | 62.81 | 62.99 |
| Rib-eye area, sq. in. | 14.68 | 14.53 | 14.50 | 14.56 |
| Fat thickness, in. | 0.57 | 0.55 | 0.58 | 0.55 |
| Marbling score[4] | 444 | 434 | 454 | 440 |
| USDA Yield Grade | 2.46 | 2.43 | 2.56 | 2.34 |
| USDA Prime, %[5] | 1.71 | 2.54 | 5.09 | 0.00 |
| USDA Choice, % | 64.91 | 64.12 | 69.52 | 69.17 |
| USDA Select, % | 24.78 | 24.82 | 21.14 | 26.67 |
| Total carcass value, $ | 1023 | 1026 | 1048 | 1033 |

[a,b]Within a row, means without a common superscript differ (P ≤ 0.03).
[1]Linear effect of zinc (P = 0.07)
[2]Linear effect of zinc (P = 0.03) and 0 ppm supplemental zinc vs. average of treatments with supplemental zinc (P = 0.03).
[4]Small = 400 to 499 and treatment effect (P = 0.08).
[5]Quadratic effect of zinc (P= 0.07).
Adapted from Van Bibber-Krueger, 2016 and Van Bibber-Krueger et al., 2016.

Final body weight (BW) and ADG were not affected by supplemental zinc supplementation. In reference to carcass traits, zinc supplementation did not affect hot carcass weight (HCW), dressing percentage, ribeye area, fat thickness, percentage of carcasses grading USDA Select or Choice, or yield grade. However, zinc supplementation tended to affect marbling score (P = 0.08) with carcasses from cattle supplemented 60 ppm zinc tending to have the greatest marbling score. As a result, carcasses from cattle supplemented with 60 ppm zinc tended to have the greatest percentage of carcasses grading Prime (quadratic effect, P = 0.07).

These researchers concluded that zinc supplementation improves feed efficiency in finishing heifers with the greatest improvement observed in cattle supplemented with 60 ppm zinc. However, carcass traits were minimally affected with the exception that supplemental zinc tended to affect marbling score and the percentage of carcasses grading Prime which might increase carcass value (greatest for cattle fed 60 ppm supplemental zinc).

[1] Galyen, W. L., P. Beck, E. B. Kegley, J. G. Powell, M. S. Gadberry, T. Hess, and I. D. S. Hubbell. 2016. Effects of bambermycin or monensin on performance of growing steers grazing wheat pasture. J. Anim. Sci. 94 (Suppl. 1): 28 (Abstr.)

[2] Beck, P., T. Hess, D. Hubbell, G. D. Hufstedler, B. Fieser, and J. Caldwell. 2014. Additive effects of growth promoting technologies on performance of grazing steers and economics of the wheat pasture enterprise. J. Anim. Sci. 92: 1219-1227.

[3] Fieser, B. G., G. W. Horn, and J. T. Edwards. 2007. Effects of energy, mineral supplementation, or both, in combination with monensin on performance of steers grazing winter wheat pasture. J. Anim. Sci. 85: 3470-3480.

[4] National Academies of Sciences, Engineering, and Medicine. 2016. Nutrient Requirements of Beef Cattle, Eighth Revised Edition. Washington, DC: The National Academies Press.

[5] Vasconcelos, J. T. and M. L. Galyean. 2007. Nutritional recommendations of feedlot consulting nutritionists: The 2007 Texas Tech University survey. J. Anim. Sci. 85: 2772-2781.

[6] Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Löest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico State and Texas Tech University survey. J. Anim. Sci. 94: 2648-2663.

[7] Van Bibber-Krueger, C. L. and J. S. Drouillard. 2016. Supplemental Zinc Sulfate Affects Growth Performance of Finishing Heifers. Kansas State Univ. Beef Cattlemen's Day Beef Cattle Research. Kansas Agricultural Experiment Station Research Reports: Vol. 2: Iss. 1 (Article 16). Available: http://newprairiepress.org/kaesrr/vol2/iss1/16.

[8] Van Bibber-Krueger, C. L., K. A. Miller, J. M. Gonzalez, and J. S. Drouillard. 2016. Effects of Zinc Supplementation on Feedlot Cattle Performance and Carcass Traits. In: 2016 Plains Nutrition Council Spring Conference, San Antonio, TX. p. 124-125 (Abstr.).